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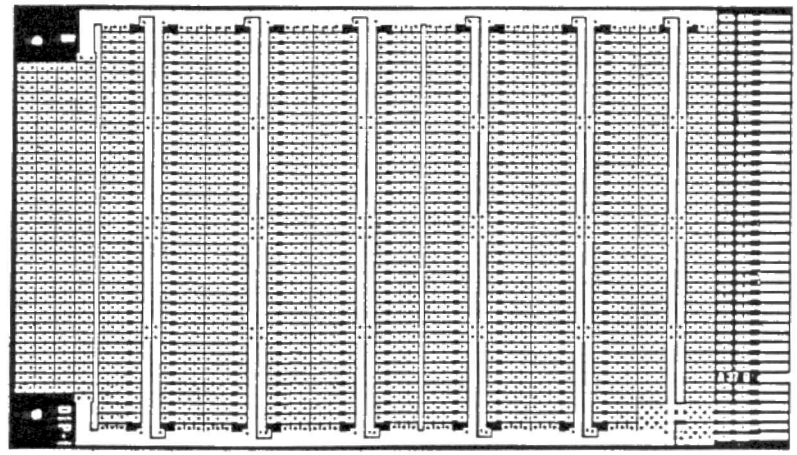
Interak 1

BREADBOARD CARD

Interak Breadboarding Card



DIP-1 Dual In Line Package Breadboarding Card

FEATURES

* International Size Card (4.5" x 8").
* Layout in general suits both 0.3" and 0.6" wide ICs.
* Area near edge connector is 0.3" pitch to suit bus buffers, address decoder etc.
* Universal connection area near card front suits IDC (ribbon cable) connectors, DIN 41612 conectors, 0.1", 0.2", 0.3" pitch headers etc up to 66 pins., or can be used for more ICs.
* Accommodates 20 or more DIL ICs.
* Design includes dedicated space for 12 0.2" pitch decoupling capacitors.
* Two common bus lines (one near the centre, one near the card front) included for optional multiple rail connection.
* Predrilled with approximately 2000 holes.
* Provision for mounting metal card front.
* Pick up points provided for 0V and + 5V at each bank of ICs.
* Double sided card; track layout repeated on both A and B sides.
* Epoxy-glass PCB, with polarising slot already present.
* Gold-plated edge connector on both A and B sides.
* 0V and 5V power supply tracks already routed, conveniently for the corner pins of the ICs.
* +12V and -12V can be connected by the user.
* ISBUS-A, INTERAK 1 bus compatible.
* Kemitron Ltd KBUS-12 compatible.
* No manufacturer's name appears on the card, thus ideal for OEM use.

DESCRIPTION

As the International Card is a standard size, there are already a number of prototyping cards available. However as they are standard cards for general use, they have not been optimised for the needs of Interak.

The DIP-1 has been designed specifically for digital IC work. It was originally intended only for our own use in prototyping new cards, but it proved so invaluable for prototyping and building special interfaces, it was soon released for general sale and has proved to be one of the best selling cards of the whole range.

Woven

Even though there might be some users who think of a card such as this as a "throwaway" card, purely for temporary use whilst prototyping, no compromises have been made in materials for the design. (A true throwaway card would be made from SRBP, ie synthetic resin bonded paper, "biscuit" board, and would have gold plating only on one side, or even no gold plating at all.) This board is made of the same quality of materials as the other printed circuit boards in the system. Because proper woven epoxy glass material is used all the holes have to be drilled, they cannot be punched as can SRPB

board or chopped fibre board (often coloured blue), and despite the simplicity of its "circuit", this is one of the most difficult boards to manufacture. Were it not for the relatively high numbers of this board which are purchased, this would probably be one of the most expensive boards in the range.

A further benefit of the DIP-1 is that it exactly suits the Interak system, in that the +5V and 0V power supplies tracks on the board are taken directly to the appropriate edge connector positions. (A small piece of wire has to be used to complete the 0V connection, since this board is not of plated through construction.)

The DIP-1 is of double-sided gold-plated epoxy-glass construction, with a "breadboard" pattern which can accommodate 20 or more dual-in-line packages. The +5V and 0V tracks run between the two rows of pins of each integrated circuit, and the polarity has been chosen so that +5V and 0V are routed within a few millimetres of the IC corner pins which are commonly used for the power supplies.

Our own analysis of circuits we and others have designed reveals that the integrated circuits near to the edge connector are usually bus buffers, gates and address decoders, all of which are 0.3" pitch, so this is the space which has been allowed in this area. The majority of the rest of the board has been laid out so that either 0.6" pitch ICs or 0.3" pitch ICs can be used. Some work with graph paper will show that to do this neatly some holes have to be spaced on 0.15" centres, which of course is perfectly possible with a drilled board like this, since the holes can go anywhere.

Vital

It is vital with digital integrated circuits to provide adequate decoupling (ie capacitors between the voltage rails, near to the ICs). A rule of thumb is to use at least one electrolytic capacitor of say 22 uF per board and numerous 47-100nF capacitors, one for each monostable and oscillator circuit (if any) and the rest distributed at the rate of 1 every 3 ICs. The type of capacitor we favour for these purposes has leads spaced at 5 mm, which is near enough 0.2", so we have provided 12 sites for such capacitors. Often the designers of general purpose cards prefer to forget that decoupling is so essential and leave you to install it in the DIP areas, eroding valuable space. (Usually being less effective also because decoupling capacitors have to be connected by the shortest route between the supply pins of the ICs they are decoupling - it is useless to decouple say the 5V pin of one IC to the 0V pin of some other IC.) So that the decoupling capacitors can be fitted neatly we have provided the holes so that they are balanced on the centre lines of the ICs, which again means a deviation from the standard 0.1" pitch grid.

There are two places (at the centre of the board and near the front connection area) where a single isolated long length of track has been provided. This is for such purposes as the provision of an extra voltage rail (mount all the ICs which need it close to that rail), or the track can be used for say a common connection where many signals feed a common node. Equally, as each end of the track is located near to either the 0V or the +5V rail, these long tracks can be used as an additional source of either voltage.

Grilling

For the purpose for which the DIP-1 is designed, plated-through holes are inappropriate (it is much harder to correct mistakes on a plated-through board, because de-soldering is so much more skilful). Therefore the side A and side B track patterns are independent, and in special circumstances you could use both sides independently. Any track which is not required is easily disposed of with a sharp scalpel and/or by grilling for a while with a soldering iron until the unwanted track lifts.

Another area which is often neglected by general purpose prototyping board designers is the method used for connection to items off the card. On one particularly ineffective commercial design, just a few connection pads are presented at the front edge of the card for this purpose. Our arrangement provides a particularly dense group of pads which can be used for many common types of connector. There is space for a total of 66 signals. One very popular method of connection is the "IDC" (Insulation Displacement Connector) generally used for ribbon cable. Straight or 90 degree types can be used here, with or without shrouds. Another type is crimp wire sockets and plugs, on 0.1" pitch in single or double rows, and yet another is known as the 64 way "Eurocard" connector to DIN 41612. Finally there is the standard 0.1" dual in line socket with its rows of pins 0.3" apart. Examination of the "universal connection area" at the front edge of the card will reveal that we can accommodate all the types of connection mentioned, and of course if the area is not fully used for this purpose, further integrated circuits can be fitted here as well.

Two holes have been drilled at the front edge of the board for the purpose of fitting a front panel to the card if desired. If this is done, and the completed card fitted into the computer rack you will appreciate that the finished job will be indistinguishable from a "pukka" printed circuit board. There is certainly no reason (unless you can't solder properly) why a circuit built on this board should be any less reliable than one built on a conventional fully tracked board.

The Interak computer is continually being developed, and often we can supply details of circuits which are ultimately to become finished printed circuit boards in the Interak range. In the meantime if you have the skills you are welcome to build these new circuits yourself so that you do not have to wait for us to produce the boards.

Other sources for circuits to build are magazine articles and chip manufacturers' application notes. Interak is a very conventional computer using "ordinary" chips and it is therefore usually a simple matter to convert a suggested design from some other system, or a generalised system, to run on Interak.

Tacky

Add-ons built by the user for non rack and card "personal" computers are often mechanically unsound eg ticky tacky boxes dangling from wires plugged into the back or the bottom of the main computer board, but because of the mechanical construction of the Interak computer such user built add-ons need be neither ticky nor tacky.

Indeed some of our professional users proceed like ourselves from a new circuit prototyped on a DIP-1 to a fully finished pcb of their own design. As software and hardware are so intimately linked one cannot be developed without the other, and several weeks can be saved whilst development is carried out on a preliminary prototyping card circuit until the proper printed circuit board is ready.

There are two main methods of construction we favour for use on the DIP-1 card. Throughout we recommend IC sockets, which can be conveniently connected with short lengths of wire to the power supply tracks. (The power supply tracks have been positioned to suit the majority of digital ICs, which generally have the supply pins at the corners of the IC package.)

With care it is possible to choose particularly appropriate places to site certain groups of ICs, for example the eight lines of a 74LS245 data bus buffer are most easily connected using short, straight wires, if the IC is placed near the edge connector directly in line with the 8 data lines from the bus. SIL (single in line) resistors which need their common pins connecting to +5V are best sited at the top of the card, because there you will find groups of holes delivering +5V.

The first main method of construction is for soldered joints to be used for the point to point wiring from one IC pin to another, the connections made via the prestripped miniature wire originally intended for wire wrapping. This can be obtained in a variety of lengths and it is so thin that several wires can be passed through one hole in the DIP-1. (It is generally best to put the maximum number of wires through one hole, and

leave the other connecting holes clear for the later inevitable connections which have been forgotten.) The wire should be hooked round the IC pin before soldering, to make a good mechanical joint, but one which can quickly and cleanly desoldered later should the need arise.

Cold process

The other main method of construction is to use exactly the same wire but this time "wire wrap" to wire wrapping pins soldered at each IC position. This is more expensive in the short run, but ultimately can provide savings, because wire wrapping is a cold process which causes no heat damage to the tracks on the board. A wire-wrapped board can be modified numerous times without damage, which is not the case with a soldered board. One possible suggestion if a wire wrapped board is to be used and reused in this way, is to "stack" all the integrated circuit sockets in a continuous line, thus the same board can be used for whatever mixture of 14-pin, 16-pin, 20-pin etc. ICs the particular application dictates. For test purposes the wire wrapping pins make very good termination posts for oscilloscope probes. If this method is adopted vigorously dual in line "headers" can be used to carry discrete components such as diodes, transistors and resistors, and the headers plugged into the sockets.

A method which we are not fond of ourselves, but you are free to use if you wish, is the use of wire wrappable DIL sockets. We do not like this method primarily because the sockets are so very expensive, but secondly because the long wire wrapping spills occupy so much space on the "A" side of the board that a card taking 1" of space rapidly occupies 2" of space, and also is difficult to handle (being virtually a bed of nails).

If all the point to point wiring of our methods is executed on the same side of the board as the components are mounted (ie the "B" side) then the finished board will be similar in size to the corresponding printed circuit construction, also all soldering will have been carried out on the "A" side, so there is no chance of singeing the insulation on the wires. However some constructors of prototype circuits like to have components on one side, solder and wiring on the other, and they of course can use this method if that is what they prefer.

NON-INTERAK 1 USES

Do not forget that entire computer systems can now be built with just a handful of chips (if you can get the right handful), and even if you have no interest whatever in Interak, you might still find a use for the DIP-1. The track layout has been optimised not only for Interak but as for the construction of any digital system, and the benefits over other general protoyping boards still stand.

CONTENTS OF KIT

There is no kit as such for the standard DIP-1, because it can be used for so many purposes. We can however supply may of the odds and ends you will need, for example suitable miniature low leakage electolytics and 47-100nF capacitors for decoupling, ribbon cable and connectors, IC sockets, prestripped wire, and 0.1" pin assemblies for wire wrapping.

ORDERING DETAILS

Order as "BDIP1", price 10.75 + VAT.

We intend to produce a manual for the DIP-1 (manual code MDIP1), but there is so much other work elsewhere on the system to be done first, it will not be ready for a considerable time. Most of the main points of usage have however been covered above, so you should have no difficulty using the DIP-1 without an official guide.